LIVE EVENT AUDIO CLASS

REVISION 2.44 - SUMMER 2023

ABOUT US

MEPAA
Music Education & Performing Artists Association

Bespoke
bespokerecording.com

This presentation was developed by Randy Brewer of Bespoke Recording and Martin Lak & Joy Kragh of Red Newt Muse Sonic Facilitation for the Music Education & Performing Artists Association (MEPAA).

Music Education & Performing Artists Association (mepaa.org) is a 501(c)(3) non-profit that provides access to music education and the arts by removing barriers and identifying resources needed for inclusion, exploration, and success.

Bespoke Recording and Red Newt Muse Sonic Facilitation operate private recording studios and small live events production businesses located in Eugene, Oregon.

The information presented here represents our opinions of how best to safely provide live sound for a small to medium venue. There are other alternative ways to do many of the tasks mentioned in this class. Find an experienced mentor and learn your trade!

CLASS PURPOSE

- Introduce you to the exciting world of stagecraft
- Connect you to resources that will further your education
- Give you a firsthand experience of what happens behind the scenes at a show
- Encourage you to obtain additional hands-on experience through volunteering at local non-profit venues

NOTE: This class presentation will be available for you to download and review

CLASS OVERVIEW

- Stagehand definition and benefits
- Event safety
- How to plan for a show
- How to select what gear to use
- How to set up and wire a stage
- How to work with the band to get a good sound check
- How to mix and light a show
- How to *strike* a stage and load out
- Next steps to further your knowledge

WHAT IS A STAGEHAND?

A *stagehand* is a person who works backstage or behind the scenes in theatre, film, TV, or live music. A team of stagehands is called a stage crew. There are other more specific terms for people who work in production such as audio engineer, mix engineer, rigging tech, lighting tech, roadie, local crew, etc. We will use the generic term *stagehand* in this presentation to encompass all of these positions.

- Typical duties includes setting up and tearing down gear, mixing sound, and operating stage lighting.

- During the performance, stagehands must stay alert and engaged so they can react quickly if something needs attention.

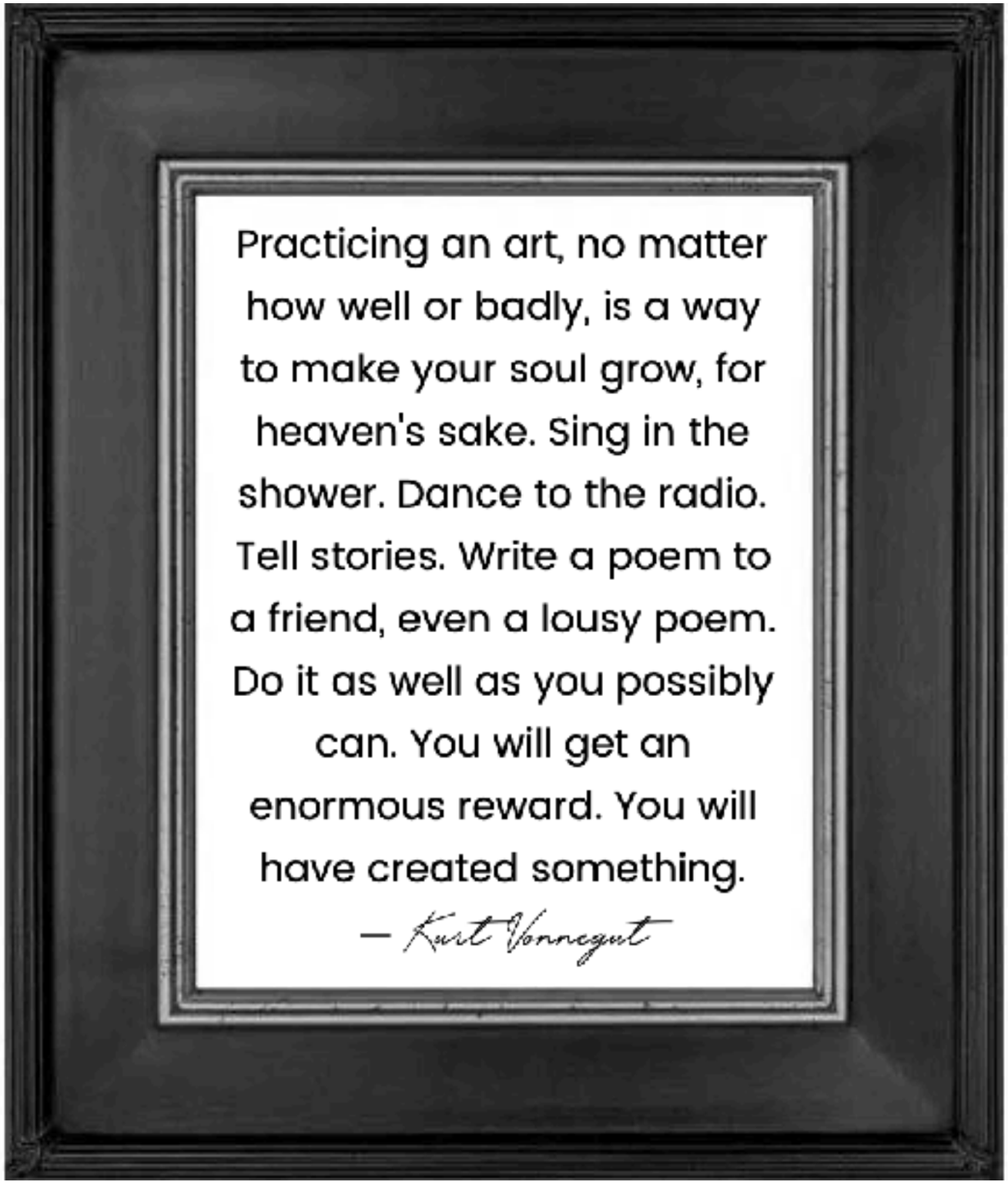
- **PRO TIP:** Stagehands often wear black clothing to blend in and not distract from the show.

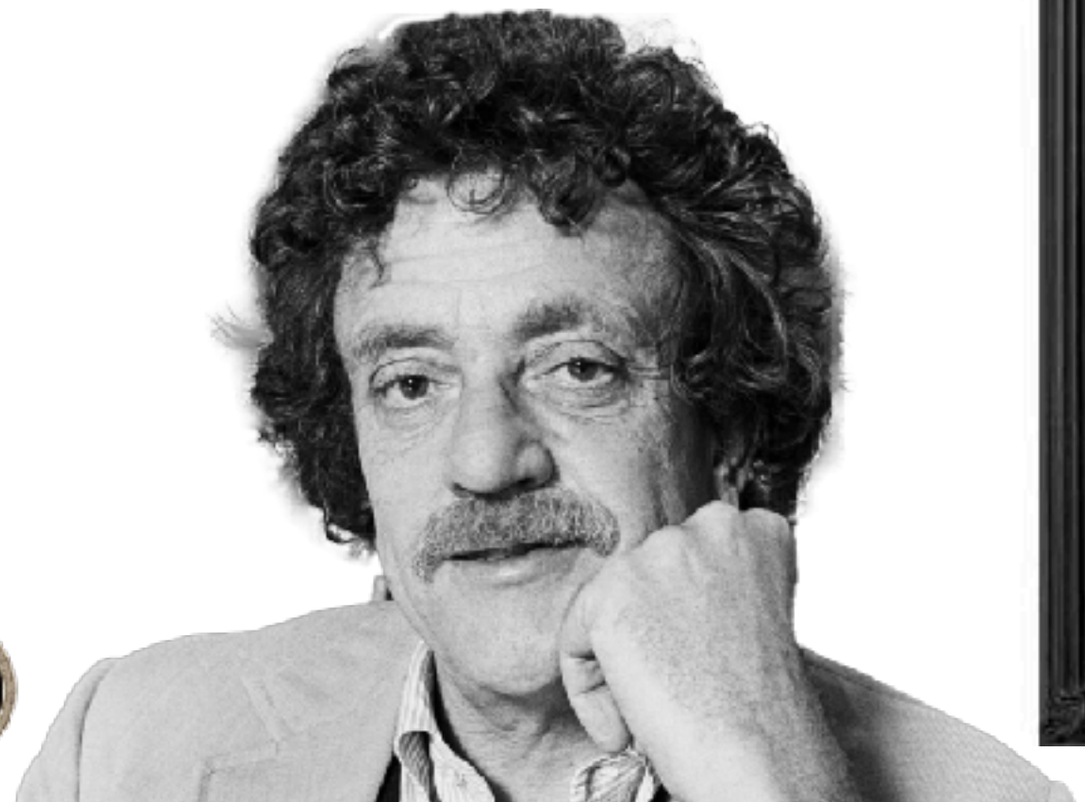
- The old saying goes "If you can see me, something has gone horribly wrong."

BENEFITS OF BEING A STAGEHAND

- There are serendipitous benefits to being a stagehand even if you don't do it as a career.

- If you are a musician or a lover of music you will find that working behind the scenes with a live performance can deepen your appreciation of the art form.





EVENT SAFETY - GENERAL CONSIDERATIONS

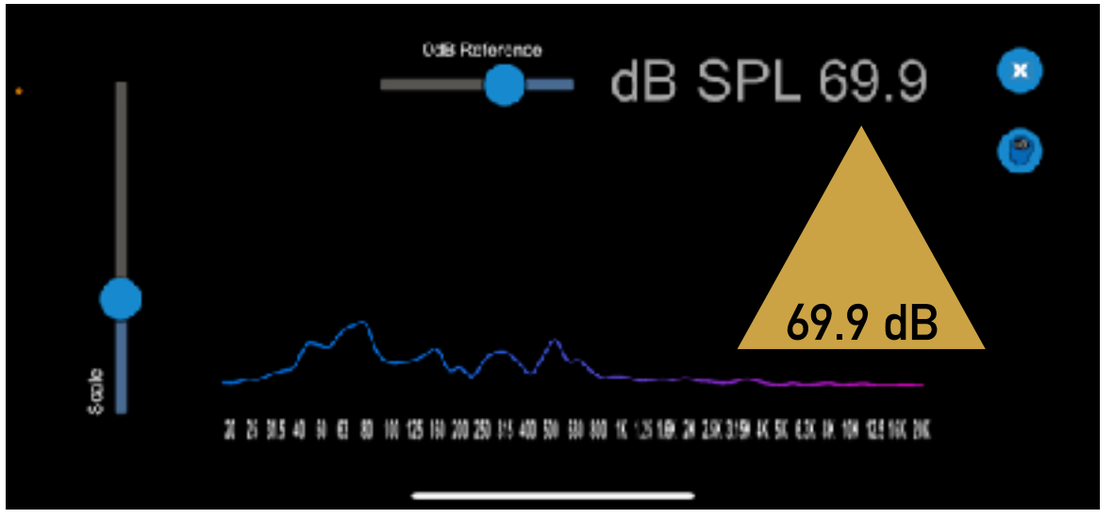
Safety is our first priority, above all other considerations. Some safety guidelines:

- Pay attention at all times
- Do the job correctly – cutting corners often results in accidents
- Dress appropriately for stagehand work. Proper protective footwear is essential. No sandals or flip-flops. Gloves are a good idea for loading gear.
- Stay hydrated, especially during hot weather. Take breaks as needed to avoid fatigue.
- Lift with your legs and always get help with heavy items. Lift ON three!
- Electricity and water/liquids do not mix
- Always report unsafe conditions and/or potential hazards to someone in charge

EVENT SAFETY - HEARING PROTECTION

It is essential to protect your hearing at loud events.

- Wear hearing protection when in loud environments. These HamiltonBuhl NoiseOff hearing protectors lower the sound level by 26 decibels and can be worn around the neck when not needed. Choose a product that allows you to hear what the audience hears, only at a lower level.
- Use a sound meter app to monitor venue sound levels. They not only help you manage the sound volume, many provide EQ information about the venue as well.



JAMES WASEM'S LIVE SOUND GUIDE APP

HAS A SIMULATED MIXER

HAS A SPL METER

HAS LOTS OF OTHER SOUND TOOLS

AND IT'S FREE

EVENT SAFETY - RESOURCES

It is beyond the scope of this class to cover all the safety-related considerations for live events. Please explore the following resources:

- More information is available from Occupational Safety & Health Administration
  https://www.osha.gov/

- More information is available from the Event Safety Alliance
  https://www.eventsafetyalliance.org/
  ESA Event Safety Guide

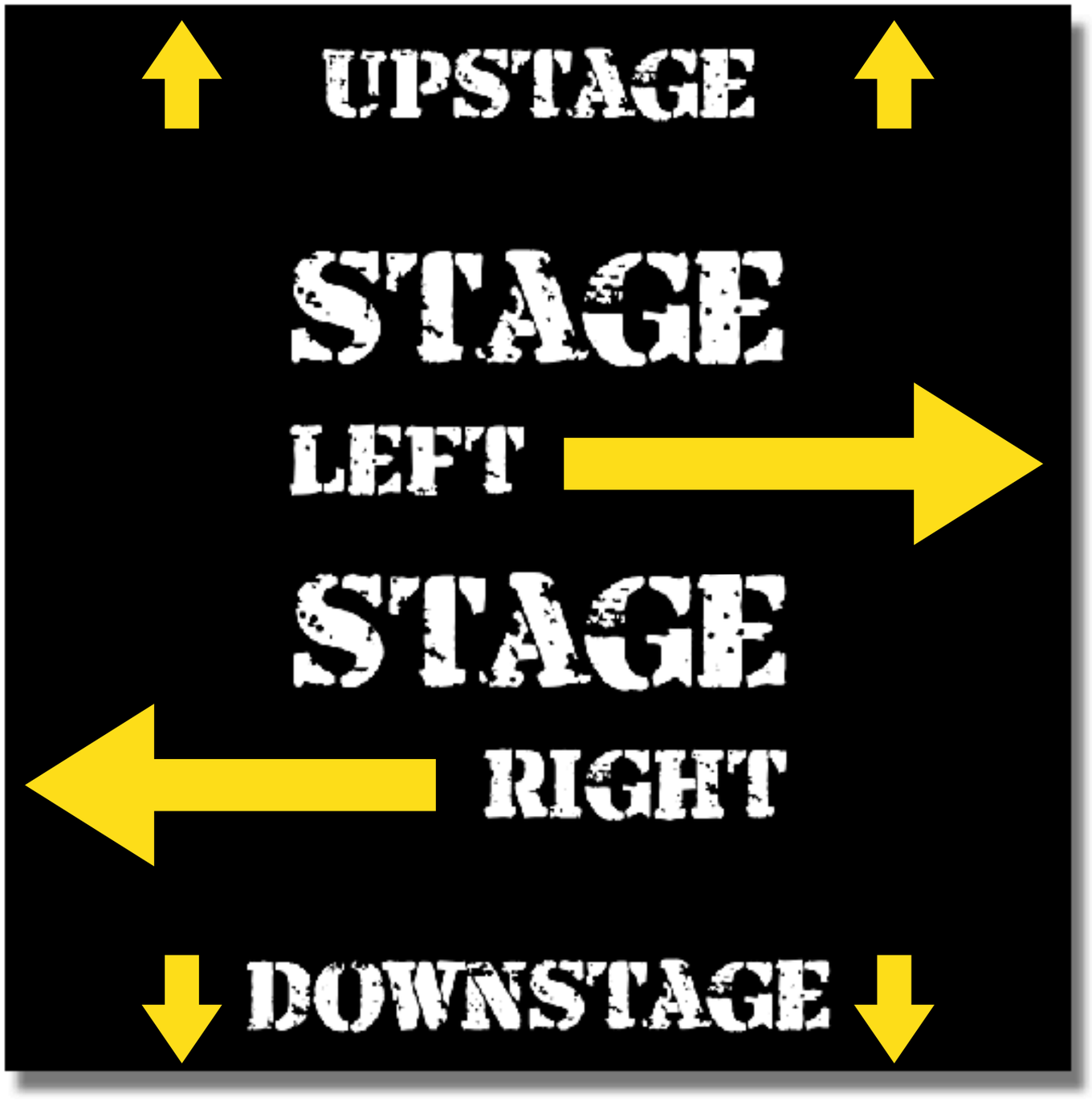
HOW TO PLAN FOR A SHOW

- **PRO TIP:** Collect pertinent information from the band well before the show
- Advance communication with the band is the key
- A stage plot is a drawn map of the stage with all the performers and their requirements noted
- With a stage plot, you have almost everything you will need to get set up

STAGE DIRECTIONS

Stage directions are always given from the performer's perspective

NOTE: This drawing is from the audience perspective - as the audience would view the stage



CHECKLIST - LOAD-IN

- Introduce yourself to the musicians and make them feel welcome
- Show them where to park for load-in
- For liability reasons, let them carry their own instruments
- Don’t leave gear unattended to discourage theft
- Keep track of what gear belongs to the band and what belongs to us
- Remember, the band may be a little nervous about the show, so be a calming influence, which can make a world of difference!

SECTION RECAP - QUESTIONS?

We have covered:

- Stagehand definition and benefits
- Event safety
- How to plan for a show

SECTION OVERVIEW - GEAR

In this section, we will cover:

- Microphones
- Cables
- DI boxes
- FOH speakers
- Monitors
- Stage boxes & snakes
- Mixers
- Lighting controllers

GEAR - MICROPHONES

First some relevant definitions:

- *Polar Pattern* - a plot that shows how well a device will reject sounds from a certain angle or from which angle the device is most sensitive.
- *Rejection* - is the quality to only capture sound in the polar pattern of a mic. A mic with good rejection suppresses unintended sounds.
- *Feedback* - The undesirable leakage of sound from speakers back into the same microphone used for capturing that sound. Self-oscillation results, causing unpleasant howling or squealing.
- *Dynamic Microphone* - a type of microphone that is durable, requires no external power, and has generally good rejection and feedback resistance.
- *Condenser Microphone* - type of microphone that is more sensitive, requires external power to operate, and has generally poor rejection.
- *Ribbon Microphone* - a type of fragile, older-design microphone that may not tolerate external power and generally has lower output. Not often used for live events but can be exceptional in the studio.

GEAR - MICROPHONES

Shure SM58 - *Dynamic* cardioid mic that is the industry standard for vocals. You can use it for almost any sound source with success and it's tough and road-worthy.

Shure SM57 - A workhorse *dynamic* cardioid mic that is the most popular mic for instruments. Always reliable and can be found at every venue. A very safe choice for mic'ing almost any instrument. The SM57 is identical to the SM58 except for the housing around the capsule and pop screen. '57s can also be used as a vocal mic if needed.

Sennheiser e906 & e609 - *Dynamic* cardioid mic that works well for guitar amps and many other instruments. It is directional (also known as *side address*), so be sure the side labeled "FRONT" is pointed towards the sound source you wish to capture.

sE Electronics - The sE7 is a small-diaphragm *condenser* microphone intended for a wide range of studio and live sound applications, from acoustic guitars to pianos to drums and beyond. More sensitive than dynamic mics. Poor rejection and prone to feedback. Like most condenser mics, these mics require phantom power to operate.

There are lots of other mics that are used for live sound. The above mics represent some popular ones that we like to use.

GEAR - CABLE TYPES

In addition to electrical power cables, you may encounter these types of cables at live events:

More common:

XLR (external line return) balanced 3-pin cables are the most common audio cable in use. Used to plug mics and DI boxes into the snake.

TS (tip sleeve) cables are unbalanced cables and are also called instrument cables. Used to plug guitars and basses into amplifiers.

TRS (tip ring sleeve) are balanced cables, stereo versions of TS cables primarily used to route stereo signals such as headphone feeds.

Less common:

DMX (digital multiplex) cables are used for lighting system connections between lighting controllers and fixtures.

Cat-5 (category 5) cables are twisted pair cable for computer networks. Connects higher-end digital mixers to stage boxes.

MIDI (musical instrument digital interface) cables are 5-pin cables used to connect keyboards and other devices to each other or to computers.

GEAR - DIRECT INJECTION OR DI BOXES

Some instruments such as basses or electronic keyboards are connected to the stagebox with XLR cables through a DI box. Some instrument amplifiers (usually bass amps) have a DI box built into them.

This side connects to the stagebox via an XLR cable

This side connects to the instrument via a 1/4" TS cable

DI boxes convert unbalanced and/or high impedance instrument signals into a format suitable for direct connection to a mixing console's mic input without the use of a microphone. Some DI boxes require phantom power and others don't.

SPEAKERS - AMPLIFICATION

Speakers used at live events are typically used as front of house (FOH) or monitor speakers. FOH speakers are what the audience hears. Monitors are what the band hears.

Both FOH and monitor speakers may or may not be *powered*, meaning that there is a built-in amplifier. *Unpowered* speakers must be connected to an external amplifier, usually located in a road case somewhere near or on the stage.

Powered speakers are growing in popularity.

Unpowered Speaker Setup

Powered Speaker Setup

GEAR - FOH SPEAKERS

We use powered speakers for our front of house (FOH) main and monitor speakers. We typically stack the main speakers on top of the sub-woofers on each side of the stage. For larger shows, we may put some subs in front of the stage area.

This is only a sample of the speakers you may encounter during a show. The good news is that they pretty much all work the same way and are all connected to the mixer via the stage box or snake, although in larger setups, they may be *daisy-chained* from an output on the stage box.

NOTE: Higher-quality powered speakers have thermal protection and will shut off if they overheat, which is why they don't like to be in direct sunlight.

Manuals for our main speakers & subs:
QSC K12 Powered Loudspeaker & KS112 Powered Subwoofer
Electro-Voice ETX-12P Powered Loudspeaker
Electro-Voice ELX-12PS Powered Subwoofer

The specific gear that you may see at a show is subject to change.

GEAR - MONITOR SPEAKERS

Monitor speakers are used to *fold back* a performer's signal so they may hear themself on stage. They are also powered and are laid on their side with the angled side facing the performer.

PRO TIP: Monitors are the #1 cause of feedback on stage. If you encounter feedback during sound check or during a show, the monitors are the first place to look for the problem.

Manuals for the monitors we use:
Electro-Voice ZXA1 Powered Monitor
Electro-Voice ETX-10P Powered Monitor
QSC K10 Powered Monitor

Again, the specific gear that you may see at a show is subject to change.

GEAR - SNAKES & STAGE BOXES

The stage is connected to the mixer with 50-150 feet (or more) of either a thick, multiple-strand analog snake cable or a thin Cat5 digital snake cable.

PRO TIP: It is essential to cover any cables laid across the floor of a venue to reduce the chance of someone tripping over a cable.

Here is the manual for the digital stagebox we use:
Allen & Heath AR2412

Digital

Analog

GEAR - ANALOG MIXERS

We sometimes use a MixWizard WZ4 16:2 analog mixer for smaller shows. This mixer has a warm, analog sound because the entire signal chain is analog. You will want to read the manual before working with this equipment: MixWizard manual

PRO TIP: If you are considering volunteering at *The Jazz Station*, here is the manual for their mixer, which is similar to the MixWizard in many ways. They also use powered QSC mains with a single subwoofer. Their monitors are all ElectroVoice products.

Allen & Heath GL2400-16 Analog Mixer Manual

GEAR - ANALOG MIXER CHANNEL STRIPS

An analog mixer has a vertical row of controls for each signal it receives from an input plug that is called a *channel strip*. This image is from the MixWizard manual and depicts several channel strips.

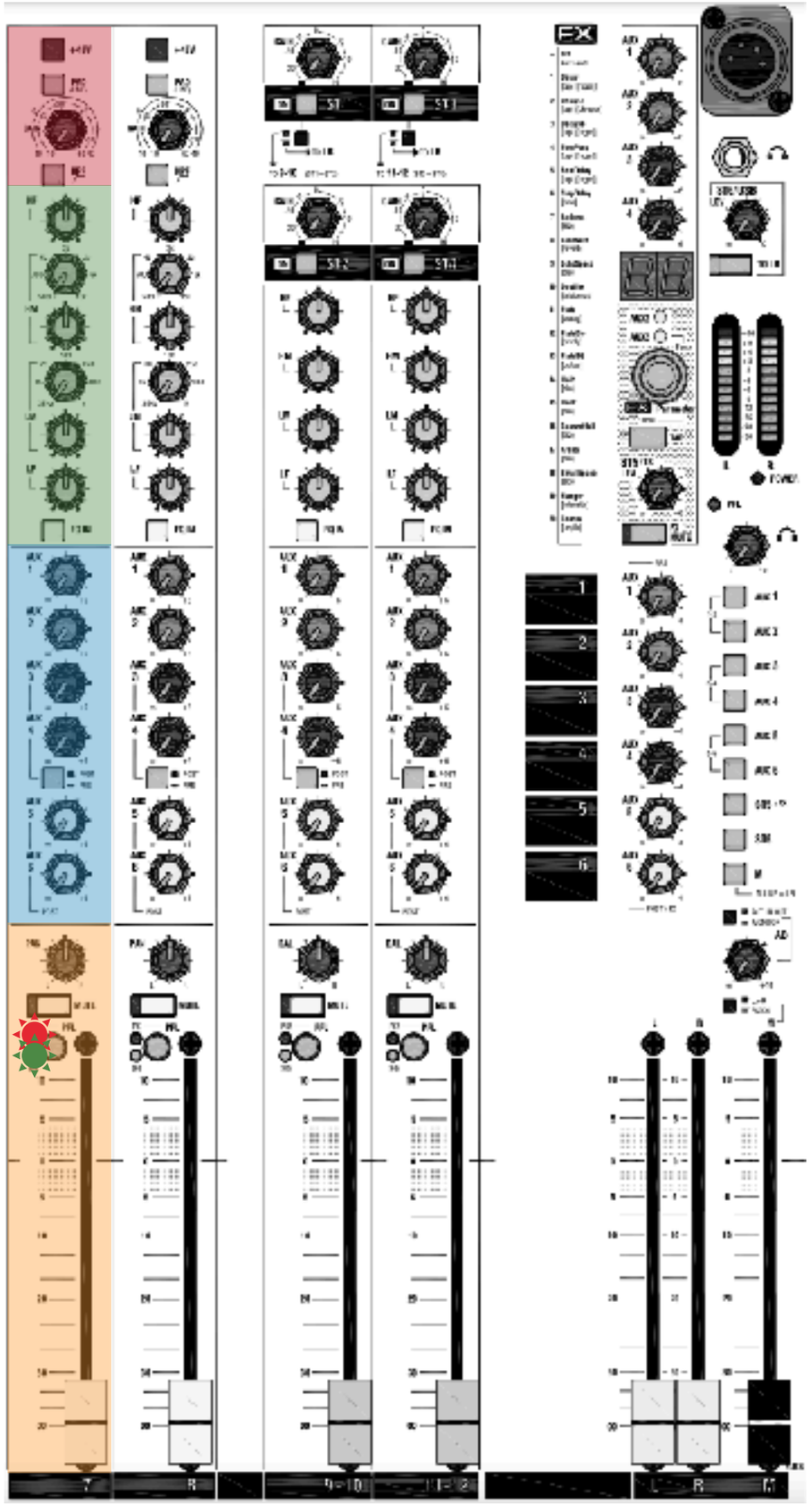
Analog channel strips are organized in order of workflow from top to bottom. The first rotary control controls *input gain* or *trim* which is the volume of the signal as it enters the mixer. Phantom power is activated by a switch in this section.

EQ controls are next, which you can think of as tone controls like on an old car radio. They shape how much bass, midrange, or high frequency is sent to the outputs.

Next is the auxiliary sends which are used to route the signal to other places besides the FOH main speakers. You can use AUX sends to send a signal to a stage monitor or an outboard reverb unit, for example.

A pan knob lets you place the signal within the stereo field. A mute button stops output to the main speakers, but *may* allow it to go the monitors. LEDs indicate signal (green) or clipping (red). A PFL pre-fade listen button allows you to hear only that signal in your headphones and see only that signal on the loudness meters. A sliding fader at the bottom controls the output volume.

Of course, the manual discusses all aspects of using this equipment.



GEAR - DIGITAL MIXERS

We use an Allen & Heath SQ-6 48x12 channel digital mixer for larger shows. This mixer features built-in multi-track recording. The work surface has 25 general-purpose faders. The channel processing section is at the top center, wrapping around the display screen.

The SQ-6 manual can be found here:

Allen & Heath SQ-6 digital mixer manual

We also recommend watching the A&H SQ training videos.
They cover all aspects of using this mixing console:

Allen & Heath SQ series video tutorials

GEAR - DIGITAL MIXER CHANNEL STRIPS

Digital channel strips are typically split into a smaller fader section and a larger processing section.

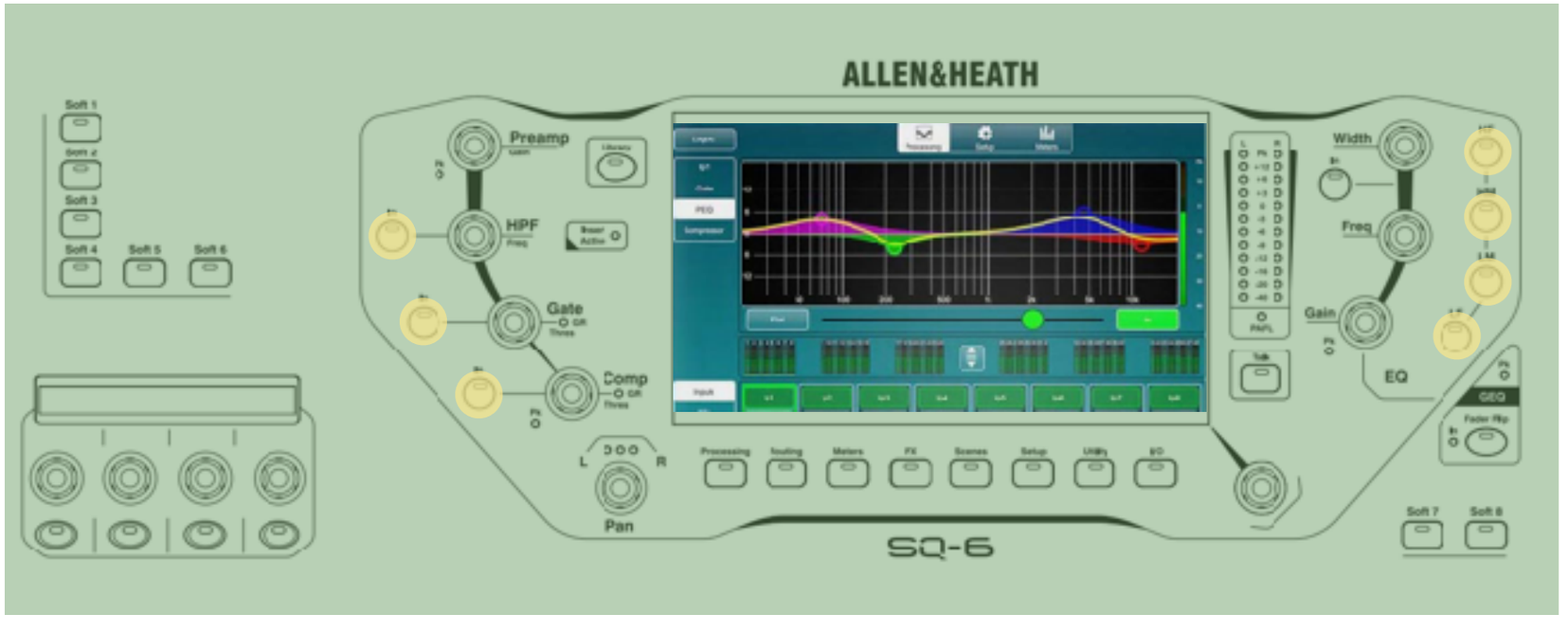
A mute button prevents the signal from being sent to the main speakers.

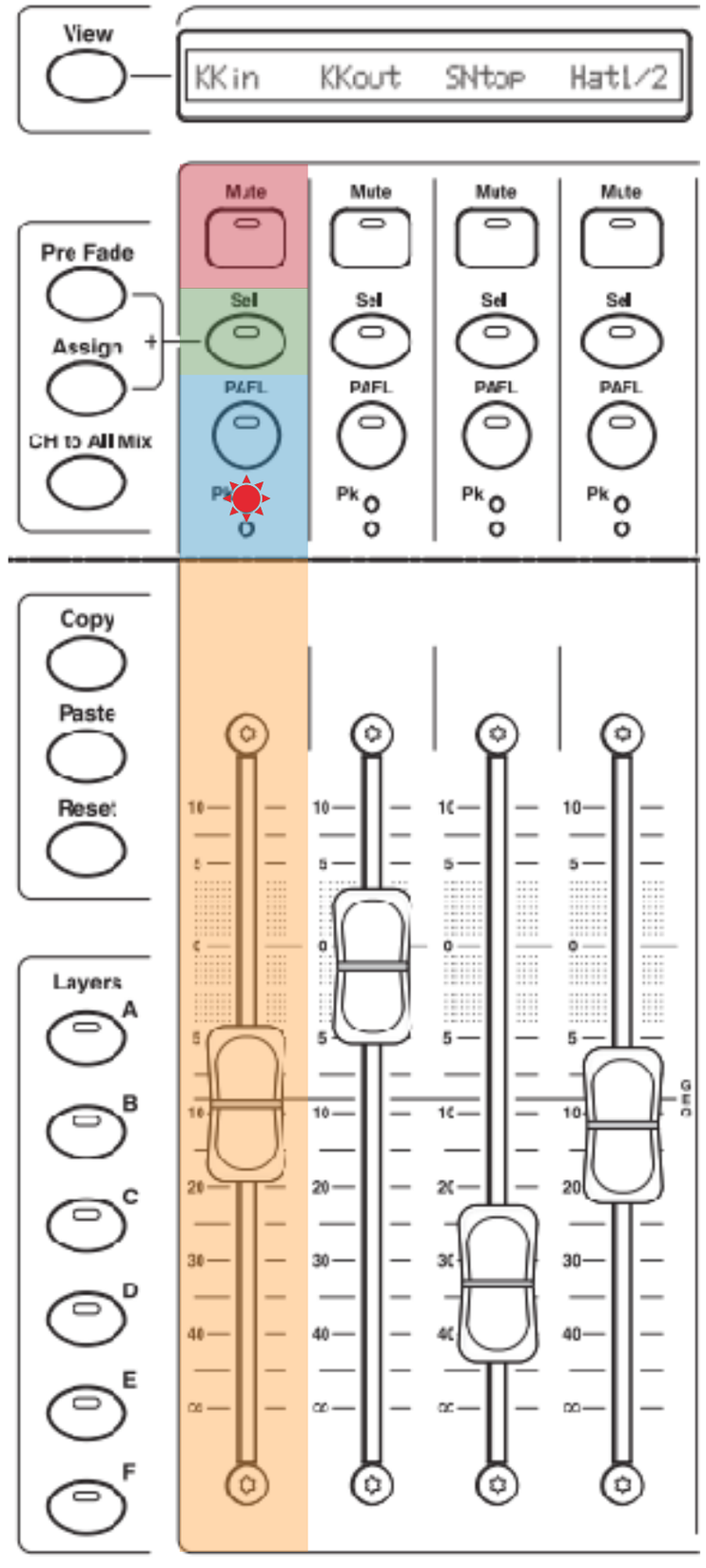
A select button causes the processing section to display settings for only that channel. The processing section on an SQ-6 is located in the center-top area of the work surface and controls input gain, hi-pass filter, gate, compression, pan, phantom power, and equalization (EQ) controls.

A PAFL (pre/after fade listen) button allows you to hear only that signal in your headphone and see only that signal on the loudness meters. A peak indicator LED indicates signal and/or clipping.

A multi-function sliding fader controls the output volume of that signal and other levels depending on context.

Reading the manual is our only real hope of understanding this equipment!





GEAR - LIGHTING CONTROLLERS

We use a very simple Chauvet Obey 4 lighting controller to manage our simple stage lighting.

The full Chauvet Obey 4 operator's manual may be found here:
[Obey 4 manual]

Here is a video about using the Obey 3, which works in a similar way to the Obey 4:
[Obey 3 training video]

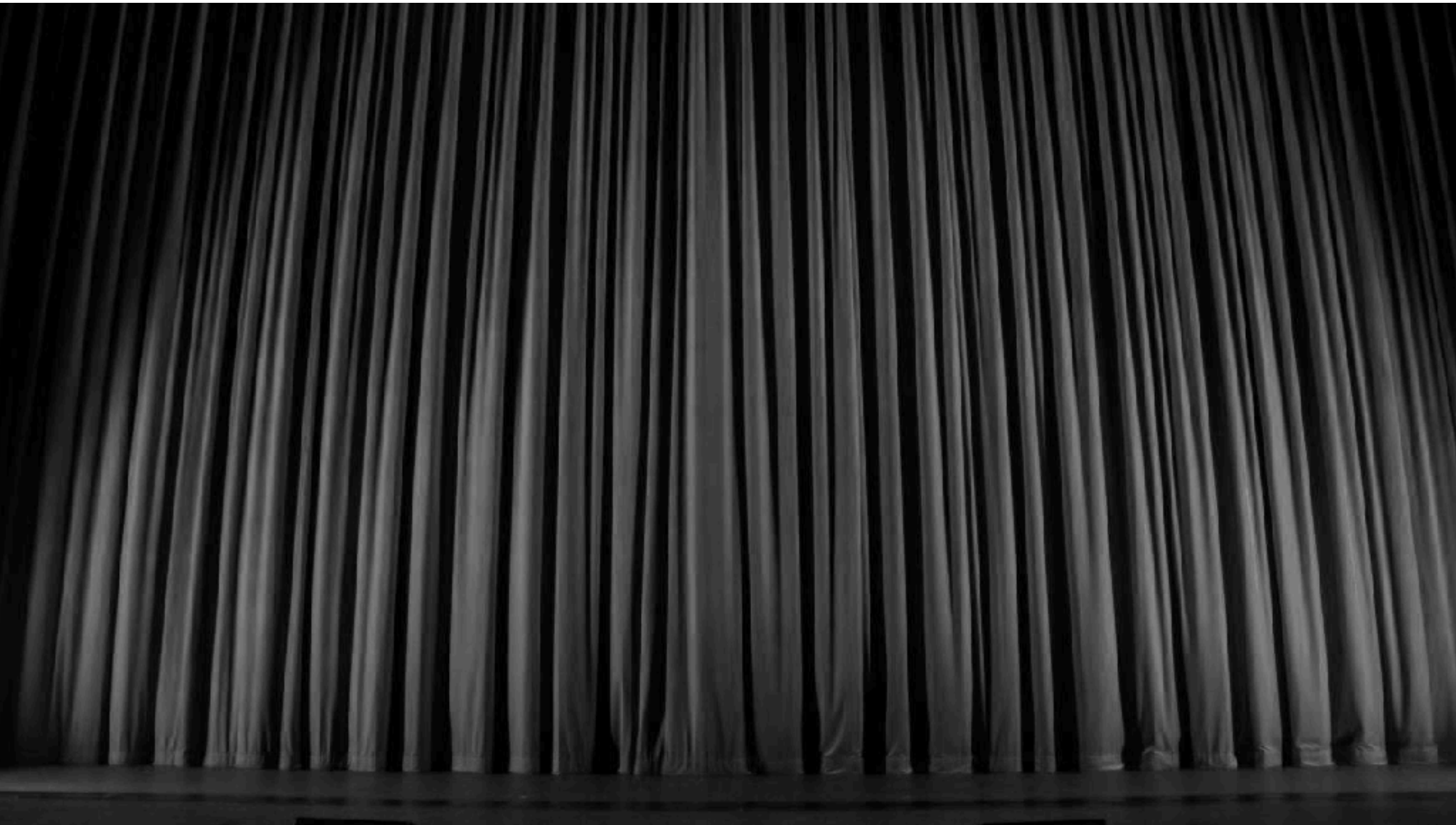
SECTION RECAP - QUESTIONS?

We have covered:

- Microphones
- Cables
- DI boxes
- FOH speakers
- Monitors
- Stage boxes & snakes
- Mixers
- Lighting controllers

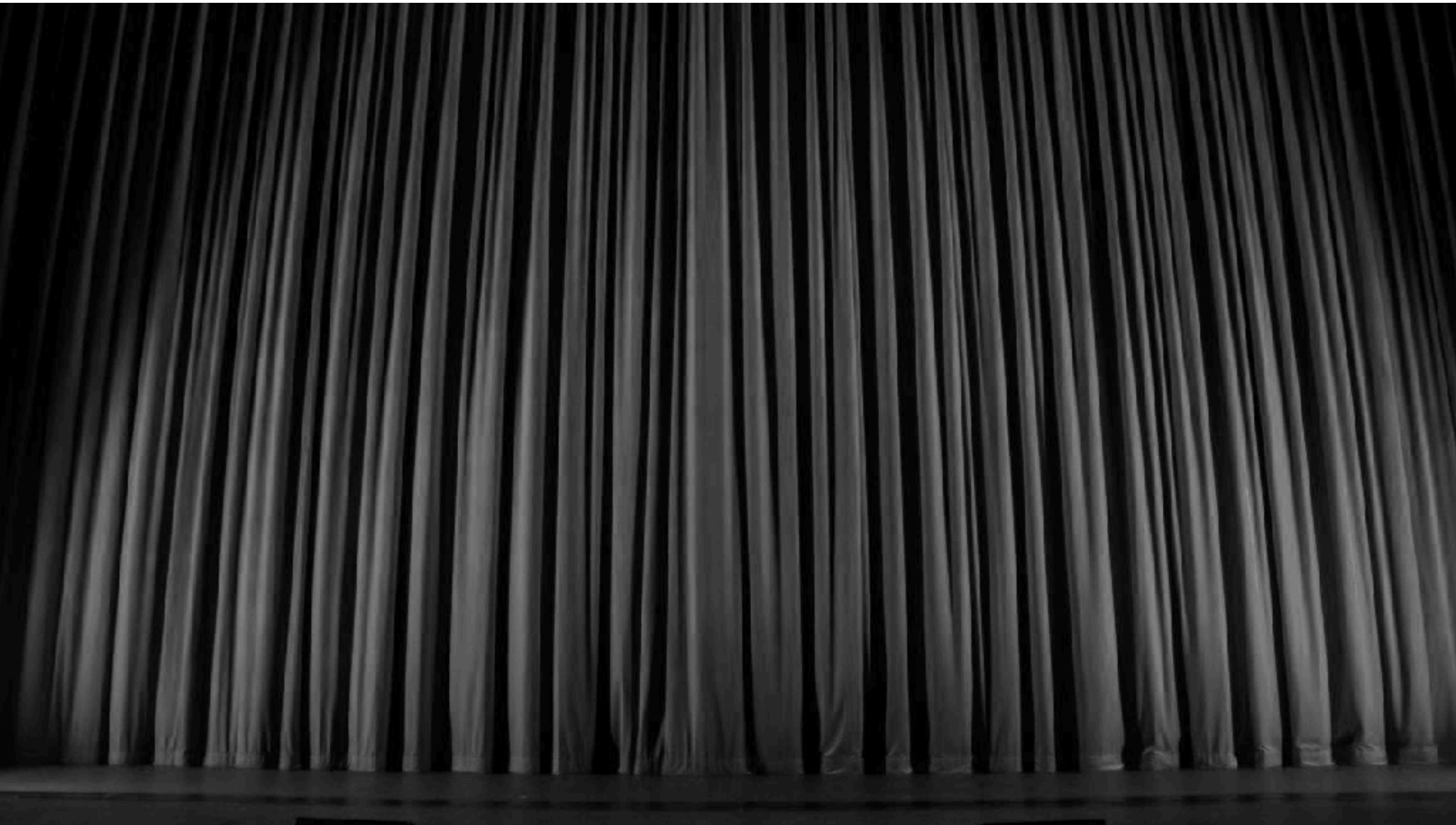
INTERMISSION

We will be right back in 5 minutes



WELCOME BACK

On with the show…



SECTION OVERVIEW - STAGE BUILD

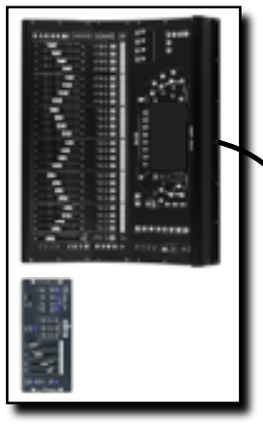
In this section, we will cover how to set up and wire a stage, including:

- The sequence of a proper stage build
- Best wiring methods
- The sequence of powering up the system
- System component configuration & testing
- Setting up the band
- Placing mics and connecting everything

There are a lot of small text labels on the following pages. When you download this presentation to your computer to view later it will be easier to read.

HOW TO BUILD OUT THE STAGE - INITIAL SETUP

Place the mixer and lighting controller on the mix desk.
Connect the stage to the mix desk with an audio snake.



MIX
DESK

AUDIENCE

STAGE SNAKE

STAGE RIGHT

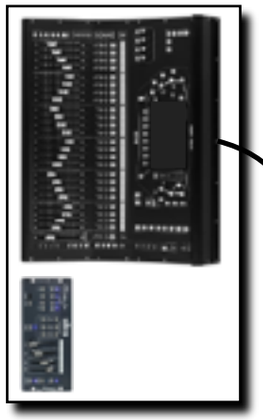
DOWNSTAGE

UPSTAGE

STAGE LEFT

HOW TO BUILD OUT THE STAGE - SPEAKER PLACEMENT

Place the front of house (FOH) subs, FOH mains, and monitors on stage. Connect to AC power (not shown). Do not energize the (power on) speakers at this time.



MIX
DESK

AUDIENCE

STAGE SNAKE

STAGE RIGHT

FOH MAINS
FOH SUBS

MON

MON

MON

MON

FOH SUBS
FOH MAINS

DOWNSTAGE

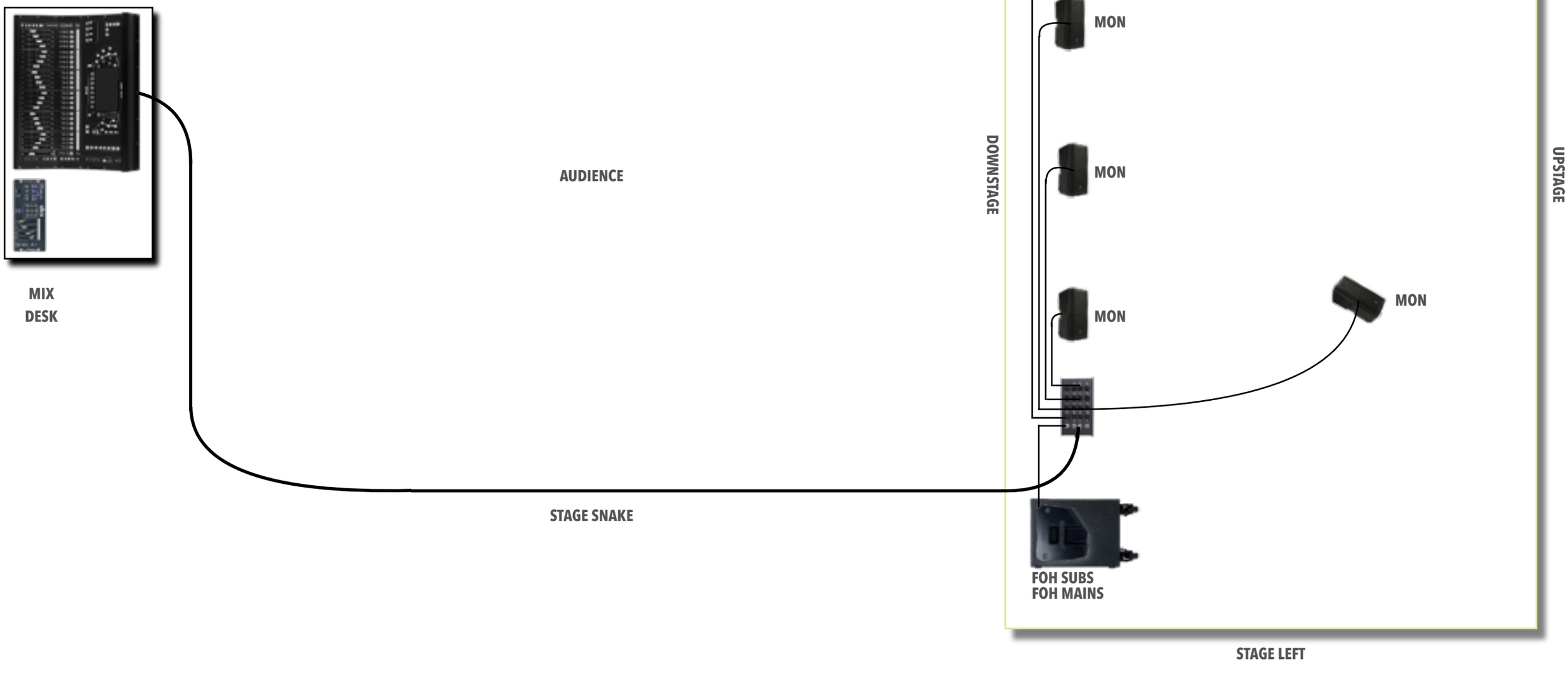
UPSTAGE

STAGE LEFT

HOW TO BUILD OUT THE STAGE - SPEAKER WIRING

Route all speaker cables (shown in black) from the stagebox along the front edge of the stage to reduce the cable clutter on the stage.

Bring the system up and verify everything is working.

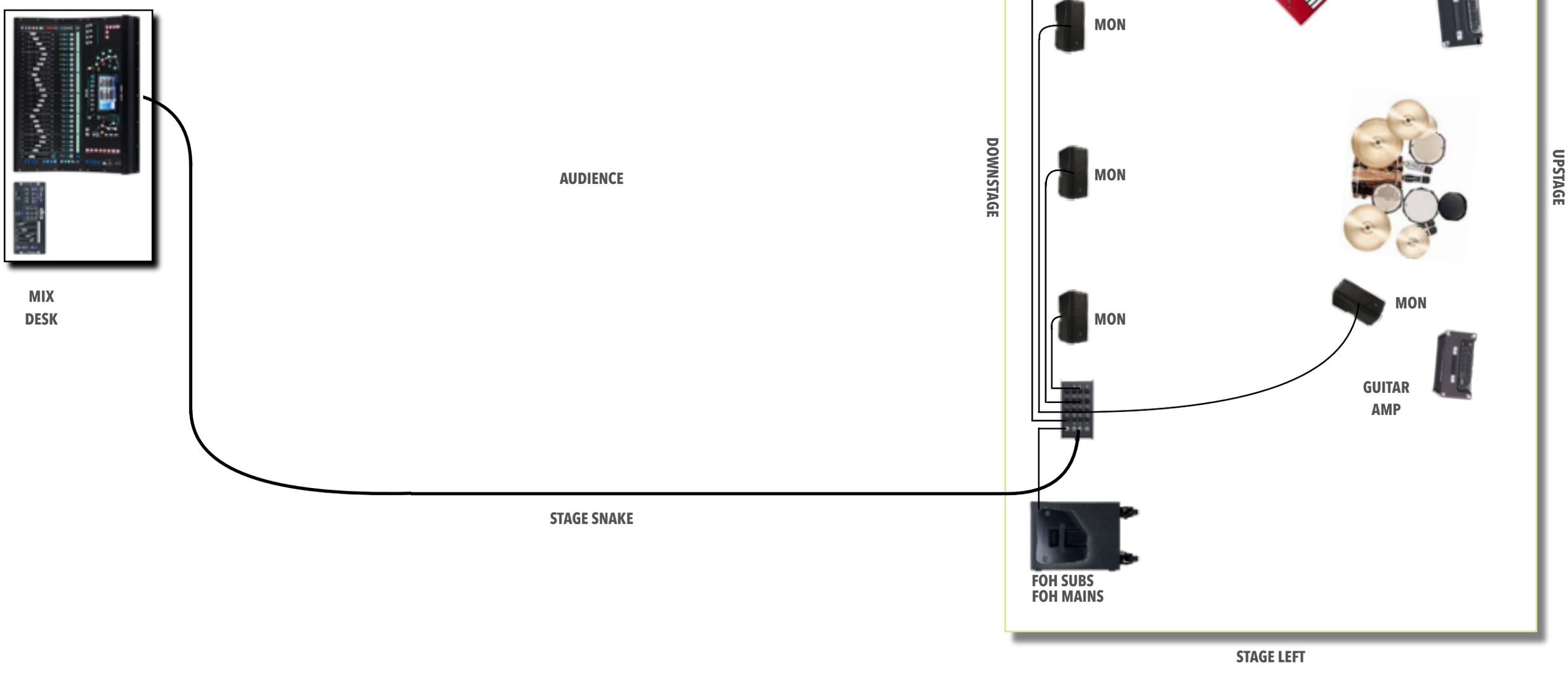


CHECKLIST - SOUND SYSTEM STARTUP

- Energize (power up) the mixer
- Mute all input and output channels
- Energize all speakers
- Ensure that all faders for input and output are set to your liking
- Unmute output to main FOH speakers, subs, and monitors
- Unmute input channels as needed
- Check that all outputs are working
- Test system by unmuting and playing house music
- Check AUX/monitor volume levels using talkback mic

HOW TO BUILD OUT THE STAGE - BAND SETUP

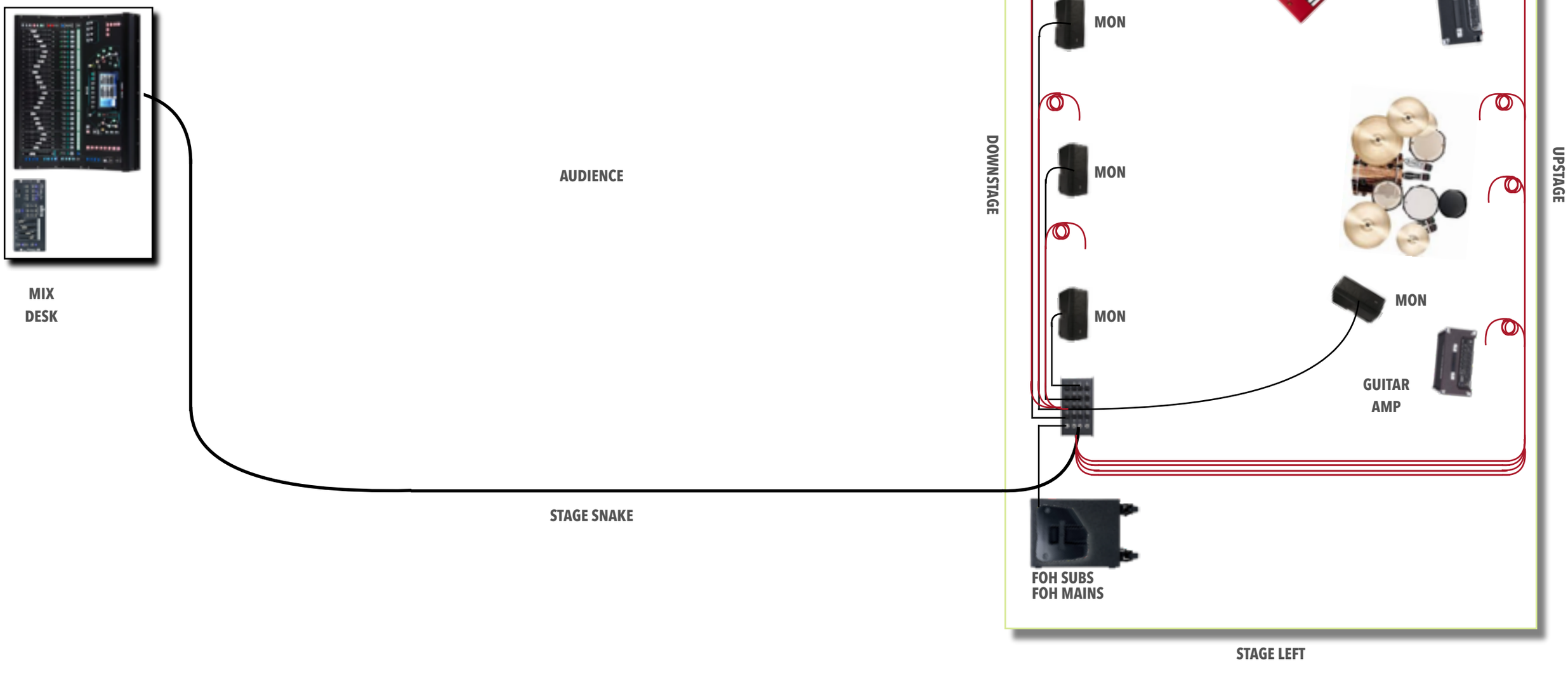
The band will typically set up around this time. Position monitors as needed.



HOW TO BUILD OUT THE STAGE - MIC WIRING

Place mic cabling across the front and back of the stage (shown in red) leaving the most cable-free area possible in the center of the stage.

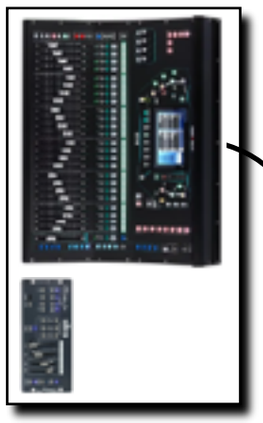
XLR cables can be extended by connecting them together for added length.



HOW TO BUILD OUT THE STAGE - MIC PLACEMENT

Connect cables from the stage box outward so that excess cable is coiled on the floor by the mic stand and not by the stage box since the mic stands may be moved.

Place mic stands and mics and test each mic.



MIX
DESK

AUDIENCE

STAGE SNAKE

STAGE RIGHT

FOH MAINS
FOH SUBS

DI

KEYBOARD

BASS
AMP

MON

MON

DI

MON

MON

GUITAR
AMP

FOH SUBS
FOH MAINS

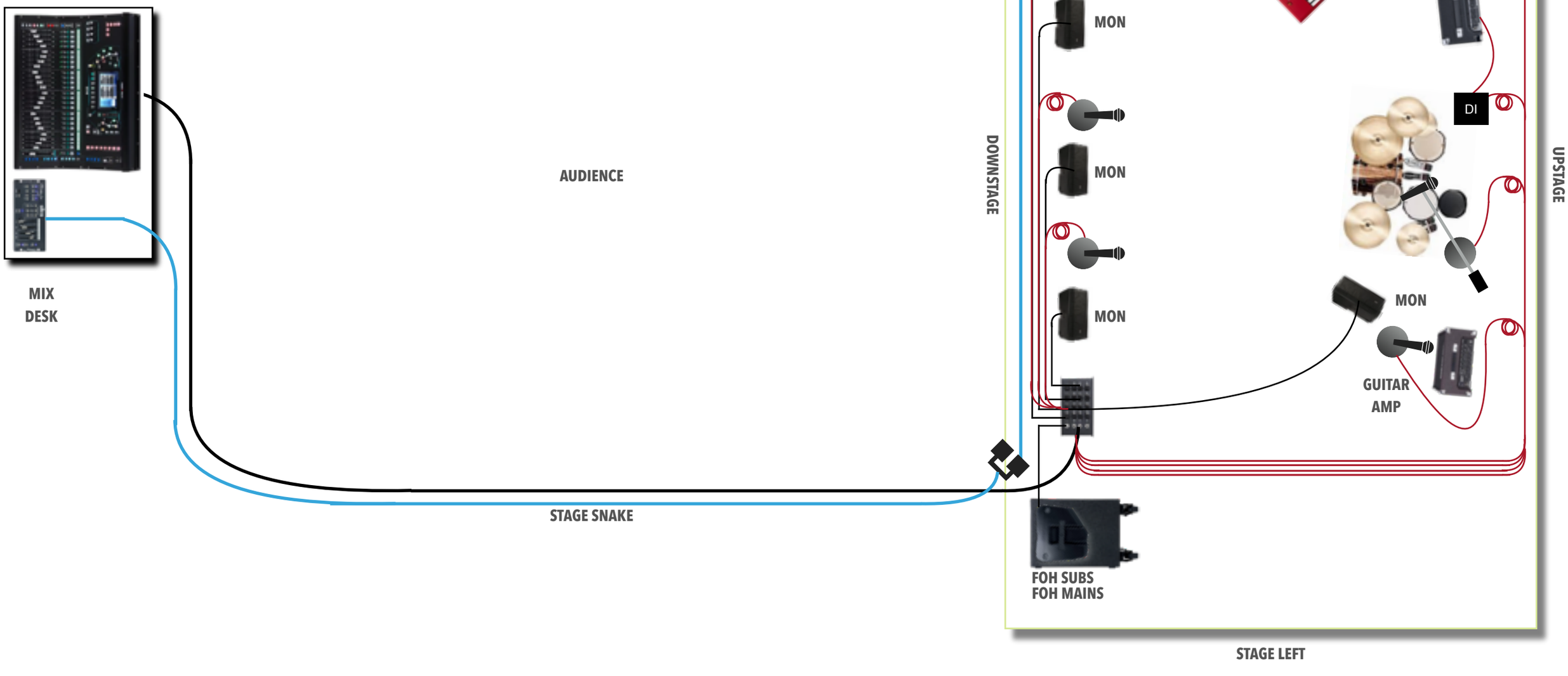
DOWNSTAGE

UPSTAGE

STAGE LEFT

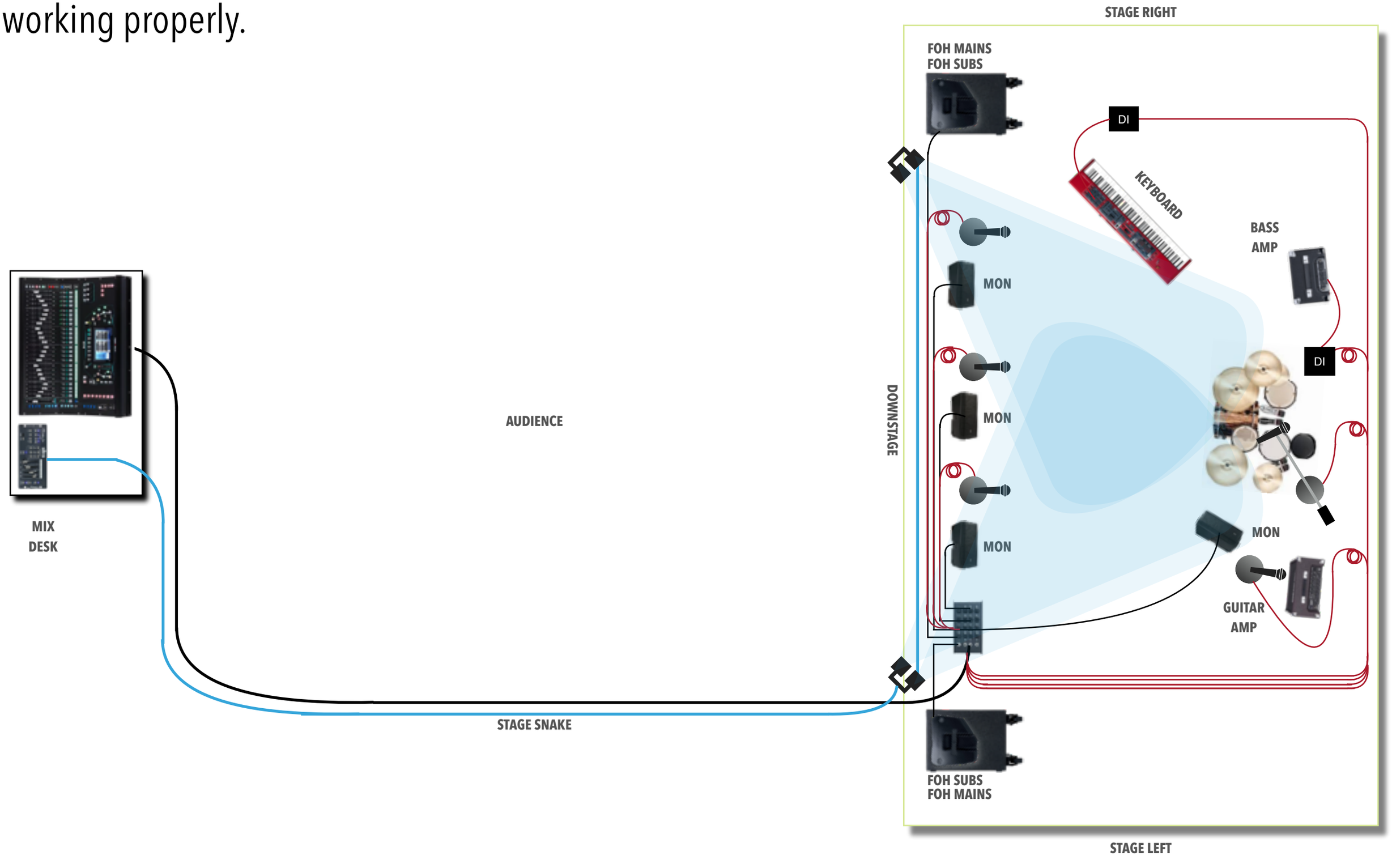
HOW TO BUILD OUT THE STAGE - STAGE LIGHTING

Place the lighting fixtures. Run a DMX cable from the controller to the first fixture. Daisy-chain the remaining fixtures with a single cable run from one fixture to the next. Use safety wires in addition to hard points to secure the fixtures to the mounting truss or pole.



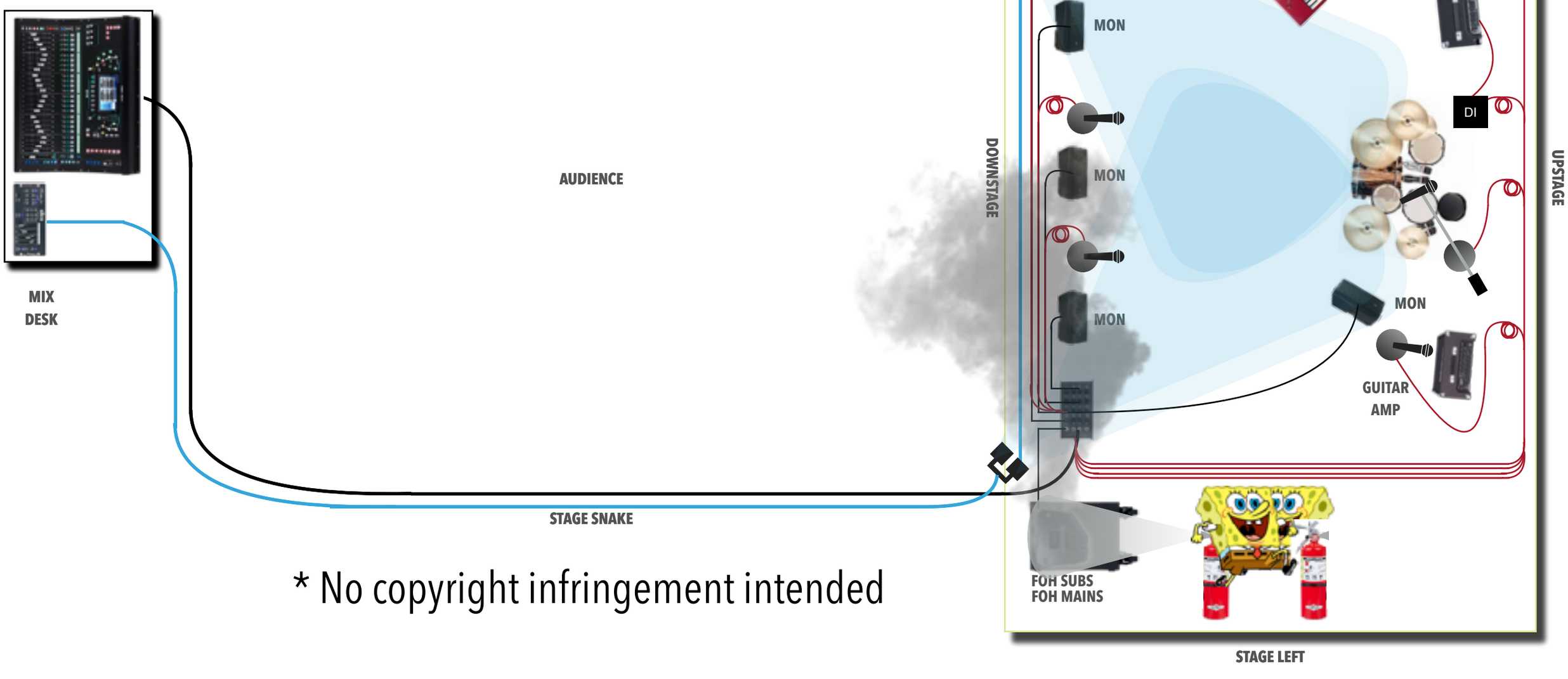
HOW TO BUILD OUT THE STAGE - STAGE LIGHTING TEST

Test the lighting system and ensure that all fixtures are working properly.



HOW TO BUILD OUT THE STAGE - SMOKE MACHINES

PRO TIP: Any piece of equipment can become a smoke machine if used improperly!



* No copyright infringement intended

SECTION RECAP - QUESTIONS?

In this section, we covered how to set up and wire a stage

- The sequence of a proper stage build
- Best wiring methods
- The sequence of system startup
- System component configuration & testing
- Setting up the band's equipment
- Placing mics and connecting everything

SECTION OVERVIEW - SOUND CHECK & MIXING

In this section we will discuss:

- How to work with the band to get a good sound check
- How to start a show
- How to mix a show
- How to use compression
- How to end a show

CHECKLIST - SOUNDCHECK

- **PRO TIP:** Get buy-in from the band regarding the value of soundcheck
- Use Martin's ***two sound bubbles*** analogy
- Work with one musician at a time ensuring you are getting their signal
- Set preamp gain levels to avoid clipping. Route the signal to the correct monitor if desired
- Put a *high-pass* (aka *low-cut*) filter on all channels except bass, kick drum, and keyboards
- Repeat for each musician
- Use talkback to talk to the band via monitors.
  Be sure not to leave the talkback mic on!
- Have the band play part of a song as a final check
- Be sure to ask each band member if they can hear themselves and adjust monitor levels as needed

CONSIDER THE VENUE ACOUSTICS

As a part of soundcheck, take the venue acoustics into consideration.

- Each live music venue has some acoustic characteristics and problems related to size, dimensions, and surfaces which every sound person should understand.
- *One Possible Problem:* The venue is reflective and high sound pressure levels are quite unpleasant for the audience.
- *One Possible Solution:* Use reverb effects with caution. Encourage performers to keep their stage volume as low as possible. Add front of house sound as needed to reach a comfortable listening level for the audience. Use a sound meter app.
- *Takeaway:* Use your ears and the tools available to you to help the artists sound their very best.
- ***Remember, you are the one out front and your listening position is the same as what the audience hears. It's <u>not</u> the same as what is heard on the stage.***

CHECKLIST - STARTING A SHOW

- Unmute announcement mic if used
- Fade out house music as announcement begins
- Bring stage lighting up
- Unmute input channels only *after* musicians plug in to avoid a loud

- If used, mute announcement mic after band is introduced
- Here we go!

CHECKLIST - MIXING A SHOW

- Adjust individual volume levels to achieve a pleasing mix so everything can be heard
- Be sure the vocals (or soloing instruments) can be clearly heard and are the star of the show
- Temporarily *ride* the faders to bring up the volume levels of soloists
- Adjust effects levels and EQ as appropriate
- Check mix often and adjust as needed
- **PRO TIP:** Apply a high-pass filter to all channels except bass, kick drum, and keyboards
- **PRO TIP:** Mute all time-based effects on vocal mics between songs so there is no reverb or echo when the band talks to the audience

UNDERSTANDING COMPRESSION

- Sometimes you might want to lower a channel if the audio source is too loud or raise that channel if the source becomes too quiet. This is called reducing the *dynamic range* since you are manually reducing the range between the loudest and quietest *transients*.

- A *compressor* is a mixing tool that will automatically do this for you if it is configured properly. It can be built into a mixer, might be a software plug-in available at the touch of a button, or might be hardware in a rack of equipment which must be physically wired into a particular channel. Although they come in different forms, most compressors work in a similar way with similar controls.

- Compression can manage the dynamic range of one or more audio channels. It is typically used on audio sources that have larger level changes such as vocals, kick drum, snare drum, and bass.

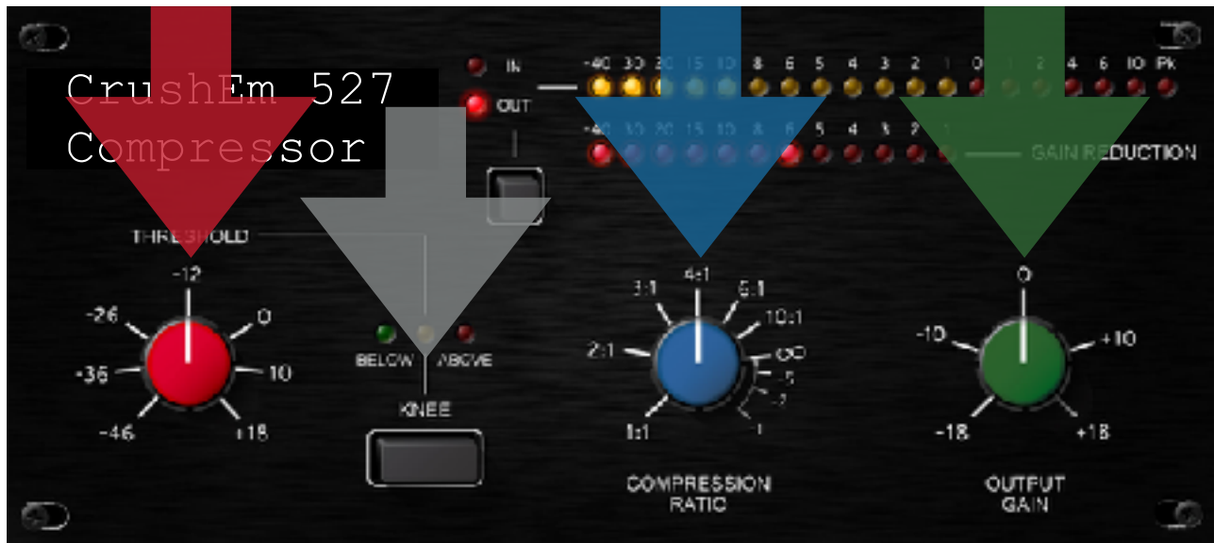
- The ***threshold*** level is the sound level that must be attained before the compressor begins to work.

- The ***knee*** refers to how quickly the compressor transitions between non-compressed and compressed states. A soft knee allows for smoother and more gradual compression than a hard knee.

- The ***compression ratio*** is the amount of compression (lowering of loud transients, raising of soft transients) that will be applied.

- The ***output gain*** is the compensating volume adjustments made to offset any gain reduction.

- Adding compression helps smooth out a mix and adds 'punch' to individual channels, but too much compression can sound "crushed" and unpleasant.



CHECKLIST - AFTER THE SHOW

- Mute all stage input channels
- Bring house lighting up
- Set stage lighting to white for load out
- Fade in house music for post-show period
- After audience leaves, mute all mixer inputs and outputs
- Shut down all speakers *before* the mixer is shut down
- Zero-out (if analog) and shut down the mixer

SECTION RECAP - QUESTIONS?

In this section, we covered how to do a soundcheck and mix a show

- How to work with the band to get a good sound check
- How to start a show
- How to mix a show
- How to use compression
- How to end a show

SECTION OVERVIEW - STAGE LIGHTING BASICS

In this brief section we will cover:

- Ideas about how to effectively use stage lighting

GOOD STAGE LIGHTING CHARACTERISTICS

- Lights the faces of the performers
- Puts color on the stage
- Uses backlighting to outline the performers
- Is part art, part science, maybe a little magic
- Spend some time working with the lights before a show
- The performers are the stars of the show, not the lights

STAGE LIGHTING SUGGESTIONS

- Lighting choices are often genre-based
- The lights should not change too abruptly or too often for laid-back performances but should be more aggressive for other genres such as EDM, rock or metal
- Slow fades from one color to another are often effective and not distracting
- One style of using lights involves gradually fading to warmer colors for faster pieces and to cooler colors for slower, more introspective pieces
- Good lighting can help make a good show into a great one
- Each stagehand must find a balance of what works for them, their audience, and the musicians that night

COLOR LIGHTING - COLOR USE IDEAS

Monochromatic Colors

You can set multiple lighting banks to the same color, known as monochromatic. Monochromatic means one color, but some people like to use different shades of the same hue, such as blue and cyan together.

Color Temp

You can create looks using different colors of the same *temperature*. For instance, you could use two *warm* colors like magenta and red. Or two *cool* colors like blue and green.

These color choices are only guidelines. There are many other color combinations that work well together in addition to those noted. Under certain circumstances, some lighting combinations may look very nice. Under different circumstances, the same combination may not work so well.

COLOR LIGHTING - COLOR USE IDEAS

Color mixing

Using color lighting, stage color combinations not available through presets can be created such as blue/green or red/orange by mixing two preset colors on different fixtures. Mixing white with other preset colors can lighten the intensity of the colors, red and white can create pink, for example.

Complementary Colors

Two colors that compliment each other. These looks work well in many situations. Common examples are:

Red/Green
Blue/Yellow
Orange/Magenta
Cyan/Orange

SECTION RECAP - QUESTIONS?

In this section, we briefly discussed stage lighting basics

- How to effectively use lighting to highlight performers
- How to create moods using color

SECTION OVERVIEW - LOAD OUT & WORK CULTURE

In this section we will learn:

- How to *strike* a stage and load out
- How to over/under wrap a cable
- Stagehand survival guide

CHECKLIST - STRIKE THE STAGE AND LOAD-OUT

- Account for and monitor all artist gear, cables, & mics
- Be sure that the band's gear goes with the band *…and our gear stays with us!*
- Over/under wrap all audio cables and put away in proper containers
- Tear down and pack all remaining gear
- Assist loading our gear into truck
- Don't leave gear unattended

THE OVER/UNDER OR PINCH/TWIST CABLE WRAP METHOD

- **PRO TIP:** If you consistently pull out two feet of cable in the first step of creating a loop, you can estimate the overall length of the cable by counting the total loops you make and multiplying by two. *For example: 10 loops x 2' per loop = 20' cable.*

- Properly wrapping a cable will prolong the useful life of the cable and may prevent shorts or other intermittent connection problems.

- The following page has a video demonstration of how to over/under wrap a cable.

THE OVER/UNDER OR PINCH/TWIST CABLE WRAP METHOD

It's good for your cables, and your reputation!

HOW TO SURVIVE AS A STAGEHAND

- Safety first
- Early is on time
  On time is late
  Late is unacceptable
- Clean up after yourself
- Mute your phone and
  keep it in your pocket
- Lift ON three
- What's said on the headset,
  stays on the headset
- If you are not sure, ASK
- Own your mistakes
- If it has wheels push it.
  If it does not have wheels,
  put wheels on it.
- Dress the part - simple black clothes, belt, appropriate footwear
- Don't steal the gaff tape of someone bigger or faster than you
- Never bug the talent
- If something falls, step aside. Don't try to catch it!
- Over/Under all cables
- Asking to borrow something implies you will return it
- Don't eat the fish at catering

SECTION RECAP - QUESTIONS?

In this section, we learned

- How to *strike* a stage and load out
- How to over/under wrap a cable
- Stagehand survival guide

SECTION OVERVIEW - GLOSSARY

On your own time, you should review the following glossary pages

- Knowing these pro audio terms will be helpful when working as a stagehand
- Proper use of these terms provides clarity and reduces confusion when communicating with other stagehands

GLOSSARY

Attenuation - is a general term that refers to any reduction in the strength of a signal, whether digital or analog. It is a natural consequence of signal transmission over long cable runs, or it may be purposely achieved with circuits to prevent overload and distortion in an audio signal path.

Cable Stretcher - fictitious tool new stagehands are sometimes sent to fetch as a prank.

Clipping - occurs in analog and digital audio circuits when the incoming signal exceeds what a particular device can accommodate.

Compression - is the function accomplished with an audio compressor. A circuit is employed to reduce gain by a variable amount when the output begins to exceed the preset threshold.

Condenser Microphone - is a type of microphone in which the capsule consists of conductive diaphragm next to a backplate.

Console - Another name for (typically) the mixer or a lighting controller.

Daisy-Chained - A wiring technique of connecting devices in a linear configuration as opposed to a spoke configuration.

Decibel - (abbreviated dB) is a unit used to measure the intensity of a sound.

Direct Box - Often abbreviated as DI (short for Direct Inject) used primarily as a device for matching the impedance of a source to the inputs of a tape machine or mixer. Typically, the output of a bass or electric guitar is a high impedance, unbalanced signal, that needs to be converted into a low impedance balanced signal, either for long cable runs to a live console. The process also allows the electronics on these instruments to function at their correct levels, thus often improving the sound.

GLOSSARY

Distortion - is the desirable or undesirable "breaking-up" of audio (as in distorted guitars.) and involves introducing artificial harmonics and other audio artifacts not present in the original signal.

DMX - Digital Multiplex is a protocol used to control devices such as stage lights or fog machines. The signal is unidirectional, meaning it only travels in one direction; from the controller or first light, all the way to the last. In its most basic form, DMX is just a protocol for lights, like how MIDI is for keyboards.

Dynamic Microphone - is a type of microphone that consists of a diaphragm connected to a coil that operates in a magnetic field. Any movement of the diaphragm due to sound pressure levels moves the coil within the magnet, thus producing an electric current. Dynamic microphones do not require external power to operate, are generally more robust, and therefore favored for live use.

Equalizer - (or EQ) is a hardware device or computer plug-in used to alter the frequency balance of an audio source. Essentially a tone control.

Feedback - In acoustics, the undesirable leakage of audio from loudspeakers, back into the same microphone which is being used for originally capturing the audio. If too much feedback occurs, the system can go into self-oscillation, causing unpleasant howling or squealing.

Frequency - In audio the indication of how many cycles of a repetitive waveform occurs during one second. A waveform which repeats once per each second has a frequency of 1Hz (Hertz.) Frequency also references to human hearing as pitch.

FOH - Front Of House. The main speakers the audience hears.

GLOSSARY

Gain - is the extent to which a circuit amplifies a signal. Usually part of an amplifier specification, its value is most often expressed in a decibel value.

Ground Loop - is a condition where current circulates in the ground wiring system, due either to the grounds at the end of a length of cable being at different AC potential, or where a video or audio system has multiple paths to ground. Manifests itself usually by varying levels of hum.

High Pass Filter - is a filter that attenuates frequencies below a certain cutoff point, while passing on frequencies above the cutoff unaffected. Sometimes referred to as low-cut filter.

Line Level - Although the term refers to the average level of a signal, these days use of the term is more specific and applies to the two line level references, balanced and unbalanced. Balanced or professional equipment operates at +4dBm or 1.23 volts, while unbalanced or semi-professional equipment operates at -10dBV or 0.32 volts. Although the distinction between professional and semi professional equipment is blurring, the important fact is that the two levels should not be speaking to each over. If two pieces of equipment need to be connected that use different line levels, then matching transformers need to be used.

Mic Level - is the level of a signal generated by a microphone. Generally ranging between 0.001 to 0.005 volts, to make it useful, the signal requires a microphone preamplifier to bring the signal up to line level.

MIDI - Musical Instrument Digital Interface is a protocol used to allow devices such as keyboards and hardware effects units to control one another. Using MIDI, you can play on one instrument or computer and control another as if you were playing it as well.

GLOSSARY

Mix - The blending of two or more signals into a coherent sound. The FOH mix is the most important part of a well-engineered show, but without a good monitor mix or mixes, it is difficult for performers to do their best work.

Off-Axis - is a term used to describe the position of a sound source in reference to the microphone recording the source. Generally, a microphone will record best when the source is directly in front of it, but since moving the microphone off-axis results in coloration of the signal, engineers sometimes use it to good effect.

Monitor Speakers - or simply *monitors* - also known as *wedges* due to the speakers usual shape. These are speakers used for the performers to hear themselves and other band members during performances. The mix going to monitors will typically be different from the FOH mix, as each performer may have different needs in terms of what parts are most important to them during a performance.

Pad - is an electronic circuit that attenuates the output of a particular device. Often found on microphones, pads are used to bring down the microphone's output level for use with a preamplifier that would otherwise become overloaded due to a hot input.

Pan - or panning refers to the act of moving the perceived location of a sound source within a stereo soundstage. Generally works by reducing or making louder the particular sound source in either the left or right channel of a stereo output.

Parametric Equalizer - is an equalizer whose filters contain controls over three parameters.

Peak - is the maximum instantaneous level of a signal, peak is the maximum value, either positive or negative that a waveform achieves. Important in audio in that when a signal peaks beyond what a circuit can handle, distortion appears.

GLOSSARY

Phantom Power - DC voltage, usually 48V that is supplied to a condenser microphone using the signal cores of a balanced microphone cable. Condenser microphone need a source of power to function and nowadays most consoles and preamplifiers provide this feature. Can damage some ribbon microphones.

Piezo - is derived from a Greek word that means to press, for the purposes of audio, Piezo microphones are manufactured by coupling a diaphragm to a small layer of crystal. When vibration causes the diaphragm to vibrate and therefore "push" against the crystal, a shift of electrons occurs within the crystal, thus creating a potential difference. Piezo microphones are sensitive to the source of the vibration, but insensitive to the outside world, and are useful as contact microphones or triggers for electronic drums.

Polar Pattern - is a plot of a device's sensitivity as a function of the angle around the device. Used to define the characters of microphones and antennas, the plot of the polar pattern will show how well a device will reject sounds from a certain angle (the back of a microphone) or from which angle it is most sensitive.

Pop Filter - is a means of shielding microphone capsules from explosive burst of air from a performer's mouth.

Preamplifier - is an electronic device used to amplify low-level signals. Commonly used to bring microphone outputs up to levels that subsequent equipment can utilize.

Pre-Fade Listen PFL - (or Pre/After-Fade Listen - PAFL) is a switch usually incorporated at the aux that allows by-passing any fader movements. Although the main fader is lowered, signal is still flowing along the aux to the desired destination. Useful when setting preamp gain, the main meters reflect only the PFL active channel(s).

GLOSSARY

Pumping - is an artifact introduced into audio source that is caused by excessive compression. Pumping, or breathing causes the program material to rise and fall depending on some frequency (usually bass) that is crossing the threshold level.

Reverberation - or Reverb is the result of a sound source being instantiated within an acoustic environment. It usually consists of multiple primary reflections that are the result of the first interaction of the sound waves with the acoustic space, followed by more spaced out and rapidly diminishing echoes.

Rejection - is the quality to only capture sound in the polar pattern of a mic. A mic with good rejection surpasses unintended sounds from *bleeding* into the signal.

Ribbon Microphone - is a type of microphone that uses a metal ribbon suspended close to a magnet. Any vibration in the ribbon is transmitted via the magnet and made into an electrical signal. An early design, ribbon microphones have recently seen a resurgence in popularity.

Shockmount - is a mechanical device that is designed to isolate the transducer of a microphone from shocks, vibrations or handling noise.

Sibilance - is the high frequency component of certain vocal sounds that can cause problems while recording or performing. Usually words that start with an "s" can produce sibilance, and some vocalists are more prone to it than others. A de-esser is a device specifically designed to dynamically correct the problem without affecting the main vocal content too much.

GLOSSARY

Snake - For audio purposes, snake refers to a type of cabling, where multiple lines are enclosed in a larger single shield. The most common use for a snake is for live sound, where microphone leads and monitor mixes are sent back and forth between the front of house mixer and the stage. Obviously it is easier to lay a single 16 or 24 channel snake than to lay each individual line. Snakes are also used in recording studios.

TRS - Tip, Ring, and Sleeve. A type of 1/4" phone plug that looks like the plug found on stereo headphones. Used in a variety of applications, namely as a balance connector, where the tip and ring both carry the signal, as a send/return connector from an insert of a mixer, and for providing unbalanced stereo connectivity, as in headphones.

TS - Tip and Sleeve. Refers to a type of 1/4" phone plug that is used for unbalanced connection.

XLR - External line return. Used in audio for sending balanced signals and microphone feeds, an XLR connector consists of three pins housed in a barrel and often having locking components. The *male* side is for sends, and the *female* is a receiving connector.

ADDITIONAL RESOURCES

- On the following pages are a few resources we suggest you explore to further your education.
- While not everyone has the same goals and ambitions, these additional resources will help you increase your technical knowledge & experience as a stagehand, no matter how far you wish to go.

ADDITIONAL RESOURCES - DOWNLOAD THIS CLASS

This *entry-level class* is intended to introduce students to live event audio.

Download a .PDF copy of the latest version of *Live Event Audio Class* here:

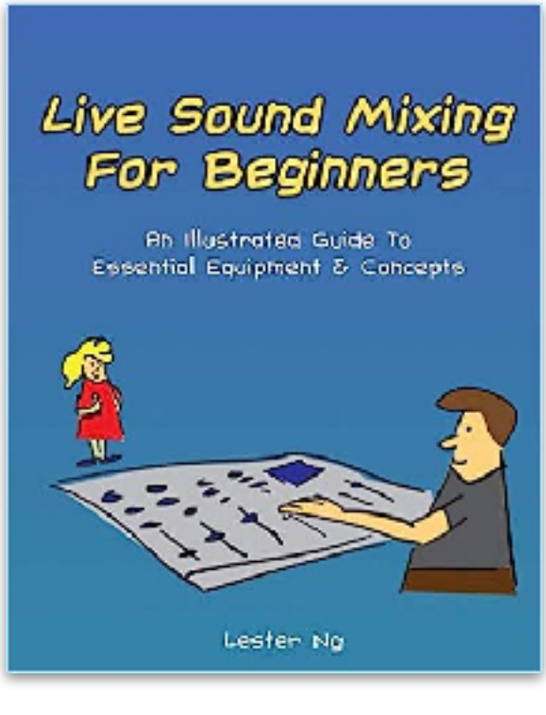
https://bespokerecording.com/audioclass.php ← Copy down this web address

Please do not redistribute.

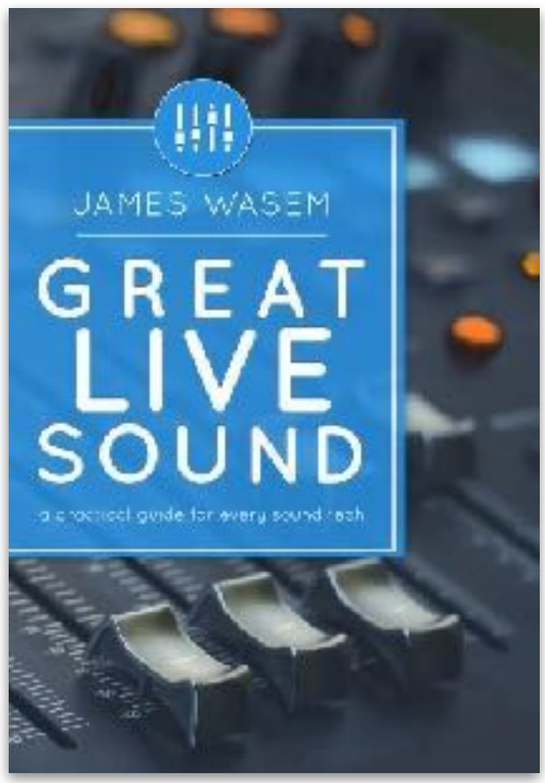
Please fill out our class evaluation which is also available from that page.

ADDITIONAL RESOURCES - BOOKS

A must-read book on the subject of learning live sound is *Live Sound Mixing For Beginners* by Lester Ng (last name pronounced "Eeng").



Another great book for more detailed and advanced information is James Wasem's *Great Live Sound.*



ADDITIONAL RESOURCES - FREE MAGAZINES

Tape Op Magazine is free to subscribers and covers all aspects of studio recording. Some crossover to live gear. Cannot recommend it highly enough.

https://tapeop.com/

FOH Magazine is also free to subscribers and covers all aspects of live event mixing and staging. Lots of good information here as well. Geared more to big shows, it can show you where your career might go in the future if things go horribly wrong.

https://fohonline.com/

ADDITIONAL RESOURCES - IATSE & AES

Founded in 1893, *IATSE (*the International Alliance of Theatrical Stage Employees, Moving Picture Technicians, Artists and Allied Crafts of the United States) is a union of more than 168,000 workers strong in virtually all arts, media, and entertainment crafts. They have training programs available for all aspects of stagecraft and are the best source of finding work in the industry.

https://iatse.net/

AES, (the Audio Engineering Society*)* is the only professional society devoted exclusively to audio technology. Founded in the USA in 1948, AES unites audio engineers, creative artists, scientists and students worldwide by promoting advances in audio and disseminating new knowledge and research. AES training programs covering all topics related to audio are often scheduled with the annual NAMM show.

https://aes.org

ADDITIONAL RESOURCES - VOLUNTEER OPPORTUNITIES

No book or slideshow can replace the hands-on experience and knowledge you will gain from mixing actual shows. In our local area (Eugene, Oregon) we recommend getting involved with *The Jazz Station* as a volunteer to gain experience. As a stage crew volunteer you have the opportunity to mix national acts of various genres once you have completed their training.

http://thejazzstation.org

NEXT STEPS

- Get scheduled for one of our live shows by emailing us from the Bespoke Recording contact page
- Volunteer for the stage crew at The Jazz Station

AND FINALLY...

Thanks so much for being a part of this class! We hope you found it beneficial.

Please provide feedback about this class here:
https://bespokerecording.com/audioclass.php

Good luck on your live event journey. We look forward to seeing you out there *in the trenches* very soon!

Bespoke

bespokerecording.com

MEPAA
Music Education &
Performing Artists
Association

NEIL ROBERTS
1950-2022

FRIEND, BANDMATE, MUSICIAN, EDUCATOR, SUPPORTER OF THE ARTS